Space Weather Forecast

Issued on Wednesday 2 October 2024 at 13:28 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Moderate-class flares and R1-R2 Blackouts expected, chance of further Strong flares and R3 Blackouts. Chance of G1/Minor Geomagnetic storm intervals Days 1-2. Chance G2/Moderate Geomagnetic storms Days 3-4.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been High over the past 24 hours with a Strong flare and several Moderate class flares. Around thirteen sunspot regions are currently on the visible disc. The most notable and largest region is in the southeast quadrant, but approaching central disc. This region has shown an increase in magnetic complexity, with growth in the compact central and leading portions and is the source of the aforementioned Strong flare. The next largest region is a new spot rotating into view around the northeast limb, the size has been modestly estimated, but is likely to unveil a larger and more complex structure in time than is currently visible. A spot in the northeast, close to centre disc is the next largest spot, with recent growth in areal extent and an increase in magnetic complexity. Two other moderately sized and complex spots reside in the southwest, with growth observed within both spots. All other spots are smaller and appear relatively benign.

The Strong flare late on 01 Oct produced a coronal mass ejection (CME) that is in the process of being analysed. Due to the location of the source region, it is likely that there will have been an Earth-directed component.

Solar Wind / Geomagnetic Activity: Solar wind parameters were indicative of a weakening stream of fast winds from a coronal hole. Speeds were slightly elevated initially, around 420 km/s, but have since eased to slow-ambient speeds of around 350 km. Interplanetary Magnetic Field remained at weak levels. The north-south component remained at weak values. Geomagnetic activity was Quiet (Kp 1-2).

Energetic Particles / Solar Radiation: The count rate of energetic particles remained at background levels with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to become Moderate, with further Moderate class flares expected and a chance of returning to High should another isolated Strong flare occur.

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Solar Wind / Geomagnetic Activity: Two coronal mass ejections (CMEs) observed leaving the Sun 29/0612UTC and 30/1545UTC may give glancing blows during Days 1-2 (02-03 Oct) but confidence in detail is very low. Of greater significance is the chance of an arrival from the CME associated with the Strong flare on 01 Oct. Analysis is currently underway, but rudimentary analysis suggests arrival time later Day 3 or during Day 4 (04/1200 UTC -05/1200 UTC).

Solar wind speeds should remain at largely background during Days 1-2, with slight enhancement possible from any CME enhancement. Elevated wind speeds are possible later in the period following the potential arrival of the CME from 01 Oct.

Quiet (Kp 0-2) geomagnetic conditions are expected to prevail during Days 1-2. There is a chance of Active (Kp4) periods or G1/Minor Geomagnetic storm intervals (Kp5) occurring during Days 1-2 (02-03 Oct) due to a possible late glancing blow of the 29 Sep CME or the glancing blow of 30 Sep CME, this risk reducing later day 2 (03 Oct). Later Day 3 and during Day 4 (04-05 Oct) the possibility of the CME arrival sees a likelihood of G1-G2/Minor-Moderate Geomagnetic Storms and a slight chance of G3/Strong Geomagnetic Storm interval should a more direct hit occur.

Energetic Particles / Solar Radiation: The count rate of energetic particles is forecast to persist at background levels, with a chance of rising above background should further notable flares occur during the forecast period.

Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	**G1 to G2**	No	20	20	40	60
Strong	**G3**	No	1	1	15	20
Severe	**G4**	No	1	1	1	1
Extreme	**G5**	No	1	1	1	1

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Radio Blackouts - X-Ray Flares

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	80	80	70	70
Very Active	R3-R5 (X Class)	Yes	30	30	20	20

Solar Radiation Storms (High Energy Protons)

Radiation Storms	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	30	30	20	20
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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